solplan review

the independent newsletter of energy efficient building practice

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No. 4 Sept. 1985

INSIDE....

With this issue Dave Blythe begins an examination of systems for heating energy efficient buildings at what we think is the beginning: a discussion of basic concepts. In the next few issues we will examine specific systems in detail.

We hope this approach to a complex subject will assist you in understanding the fundamental issues in energy conservation. We also hope that you will share your experiences in this important subject

Professor Ray Cole deals with an equally important issue: Building Code Energy Standards. Everybody hates the idea of codes (an infringement on creativity) and leans on them mercilessly (it may be the government's minimum standard but its all you're getting out of me dear client).

Other items include a detail that shows you how to keep preserved wood foundations warm and dry, a definition of air & vapour barriers (there is a difference), new energy efficient prefabricated fireplaces, and more.

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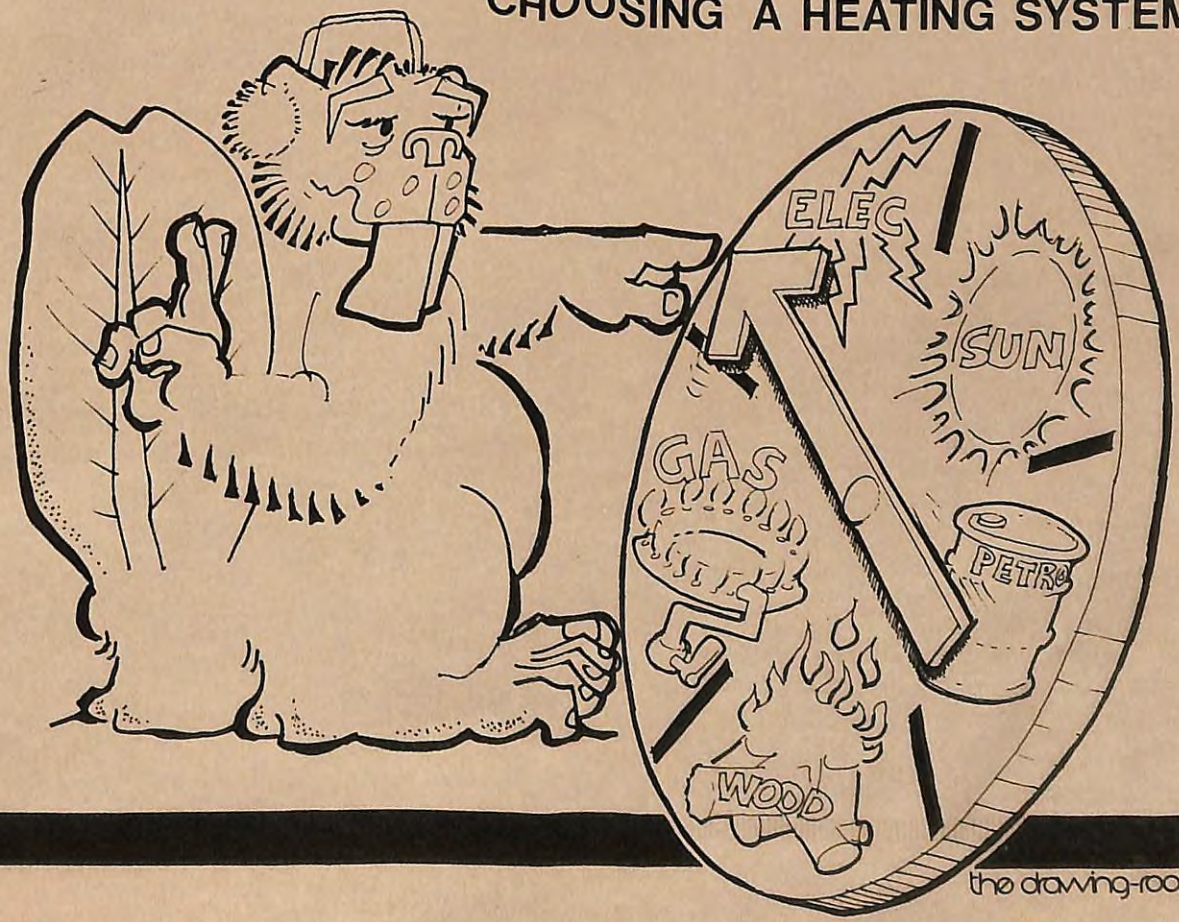
CHOOSING A HEATING SYSTEM



FROM THE PUBLISHER

Where has all the enthusiasm for good quality liveable housing gone? It seems that in a buyers market builders were interested in looking at new ideas. Now that the economy is turning around there's some backsliding to the old ways of doing things.

Houses built to R2000 standards not only provide energy efficient houses, but superior quality, liveable dwellings. Surveys show that the public looks favourably on the program once they find out about it.

But that's the problem - PROMOTION. There should much more aggressive marketing to the public. The only people doing any substantial promotion are Fibreglass Canada and DOW Chemicals, and as insulation manufacturers, they have a vested interest.

The strength of the R2000 program is its builder education and public awareness activity - but has anyone heard anything lately? This is one instance where government should be providing guidance. The industry (with the two noted exceptions) seems to be either incapable or unwilling to take action. Isn't it time that we see some real activity?

Richard Kadulski

LETTERS TO THE EDITOR

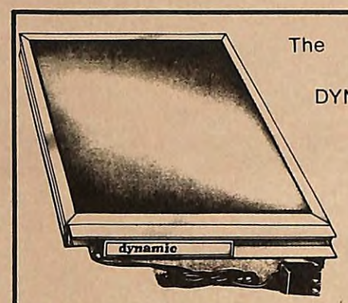
In response to your editorial (SR No.3), enclosed please find my order for my personal subscription.

Congratulations on the quality of your rag. I read it all, which is unusual as I see so much of this stuff.

Dara Bowser
The Air Changer Co.
Toronto, Ont.

Sincere congratulations on the latest issue of SOLPLAN REVIEW. I was delighted to have the information in it.

Kim Krenz
Abrico Management
Lakefield, Ont.



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HEATING SYSTEMS FOR ENERGY EFFICIENT HOUSES

By David Blythe

Comfort, convenience and automatic operation are key considerations for selection of a residential heating system.

Typical conventional systems are often oversized and inefficient. Energy efficient houses require a completely new philosophy of heating system design.

Low energy homes must be considered as a total system. That is, all energy available to the house from lighting, passive solar gain, heat recovery ventilators, etc. becomes part of the heating system. An energy efficient home requires only a small heating system, but one controlled in a more sophisticated manner. Oversized heating equipment will provide needed heat, but very inefficiently, something like putting a 500 horsepower motor on a canoe.

A typical low energy house has a design heat load of 5-6 Kwh (17,000-20,000 BTU). Until recently, the smallest furnaces available had an output of 50-60,000 BTU or more. Previously, the only suitable units were designed for mobile homes. While small, the units did not have the ability to distribute heat more than a few feet.

The amount of heating required is measured in degree days; a measure of the amount of time that the outdoor temperature is below 18 C (or 65 F). Below this temperature, a home will generally require heating.

In most areas of Canada, heating is required throughout the year. Demand varies from year to year, and from region to region. Close to 60% of heating costs occur during November, December, January, and February.

TYPICAL HEAT DEMAND DISTRIBUTION

SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR
6%	8%	12%	15%	15%	12%	8%	6%

A well built energy efficient house will normally require heat only from late October to March.

Energy Sources

These fuels are usually selected to power heating systems:

*ELECTRICITY *NATURAL GAS
*PROPANE *OIL *WOOD

Choice of fuel depends on:

*Local availability *Price
*Supply security *Equipment preference

Heating costs in the low energy home can be as little as 20% that of the typical conventional home. While costs depend on the fuel chosen, the efficiency of the total system and its control strategy are dependent on local climate and occupant lifestyle.

ELECTRIC HEATING

Most homes today require electrical service for appliances and lighting. An electric heating system (provided low cost electricity is available) reduces the cost to the homeowner, as most utilities now charge a flat meter charge service charge for each energy mode which is applied over actual energy costs.

Most R2000 houses built now use electricity for their heating, to avoid these meter charges and avoid combustion air/flue problems.

Advantages:

* No vents, combustion air or fuel storage required.
* The heat source can be a central furnace or heaters in each room
* Electric service easily located
* Single utility service charge
* Low maintenance costs
* Usually a low initial cost and easy installation
* Humidification and filtration can be added to forced warm air system if needed or desired

Disadvantages

* Higher operating cost than other fuels
* Larger panel & service required
* Environmentaly costly if electricity is generated by thermal plants using coal, gas or nuclear fuels
* Places peak load demands on many utilities

NATURAL GAS

Natural gas, where it is available, can be an economical fuel source for forced warm air systems or hydronic systems.

Advantages:

* Generally gas is the cheapest fuel source, per unit of energy.
* Equipment is generally easily available and serviced
* Humidification and filtration can be added to forced warm air system if needed or desired

Disadvantages:
* Generally it means a second utility service charge for the home
* Requires combustion air, and vents, making sealing the house more difficult
* New energy efficient gas appliances (such as the forced draft units) are more expensive.
* Improper installation or damage to system could in certain cases cause an explosion

OIL

Use of oil for space heating is decreasing. However, in areas away from distribution grids, it provides a reasonable alternative.

Advantages:
* Good operating efficiencies are available
* A storable fuel source does not impose peak demands on utility grid system

Disadvantages:
* Fuel storage tank required
* High maintenance and operating costs
* Can be smelly
* Requires combustion air and flues

PROPANE:

Advantage:
* High heat content

Disadvantages:
* High operating costs
* Moderate maintenance, initial costs
* Fuel can pool so safety factor is less than for natural gas
* Requires combustion air and flues

WOOD

Wood has gained popularity as a heat source in recent years. Remember that a subsequent owner may not have your enthusiasm for the extra work involved.

Advantages:
* Low operating costs
* Free fuel source in certain areas (particularly rural communities)

Disadvantages:
* More dangerous than other fuels if appliances not maintained properly
* Somewhat higher initial cost especially if combined with other fuels
* Fuel storage and preparation required
* Creates environmental pollution, especially if not properly maintained or burned
* Requires combustion air and flues

TYPES OF HEATING SYSTEMS

There are two types of heating systems used in modern homes. One is the central system where heat is generated in one spot and distributed as needed. The second type is the unitary system which provides heating (and is controlled) at the point of use.

Central systems

Forced warm air

The forced warm air furnace is the most common, easily supplied, installed and maintained system. It consists of a furnace, ductwork to distribute the warmed air and a single control thermostat.

An advantage of the forced warm air system particularly for low energy homes is its ability to move heated air from solar heated areas throughout the house. An electrostatic filter may be easily installed to clean the air.

Forced warm air systems should be designed by an experienced professional. Traditionally, they are designed and installed by heating trades who design by tried and true 'rules of thumb' (which may not always be appropriate where subtlety is required).

Advantages
* Furnace is compact & easily located
* Humidification easily added
* Air filtering possible
* Generally low maintenance
* Generally most economical system

Disadvantages
* Variety of efficiencies in equipment; improper sizes lead to costlier units
* More complex installation, operation and maintenance.

Hydronic systems

Hydronic systems are less common but may have advantages over forced warm air. These systems consist of a boiler, radiators or baseboards, piping, pumps and a thermostat(s). The home is more easily broken up into zones for variable temperature control. This requires a number of thermostats and possibly pumps depending on the number of zones.

Hydronic radiant floor heating uses a warm liquid (usually heated water),

circulated through pipes embedded in the floor.

Hydronic baseboard systems are also very comfortable but the baseboards may not be pleasing to the eye.

Advantages:
* very comfortable
* area control
* thermal mass evens out temperature fluctuations
* out of sight (if under floor)

Disadvantages
* most costly of heating systems
* extra support for weight of concrete
* difficult to repair of leak occurs

UNITARY SYSTEMS

Unitary systems consist of a heat unit and thermostat in each room. The heating unit may be a register, baseboard, or panel. A supply of energy must be provided to each unit.

Electric baseboard heaters are the most popular unitary heaters because of their low initial cost and simple installation. These heaters provide heat mainly by convection with radiation playing a minor role.

Some baseboards are available with small fans or blowers which help in air circulation. Recessed baseboard heaters are available but care needs to be taken to reduce heat loss behind them due to reduced amounts of room for insulation.

Sizes of baseboards are available from 300 watts. Most are 500 watts or larger, increasing in 250 watt increments.

Electric radiant ceiling systems provide very even heat distribution through a thin network of wires sandwiched between two layers of plastic. The resulting membrane is tacked to the ceiling joists and covered with typical ceiling surface materials such as drywall. The wire sandwich causes the drywall to heat up and radiate heat to the room below, much as the sun radiates its heat to the earth. The warm surfaces in the room make for a very comfortable environment for the occupants.

Control is on a room by room basis. Operating cost is reduced because this system allows the ambient air temperature to be reduced without occupant discomfort. Thermostats may be set at 68 F rather than 70 or 72 F for the same level of comfort.

Advantages:
* not noticeable
* no vents, chimneys, combustion air requirements
* room/room control
* superior comfort
* single utility service charge

Disadvantages:
* costs more than electric baseboard or forced warm air
* may be damaged if object pushed through ceiling finish (e.g. nail or hangers for plants)

Selecting the appropriate system

If you understand the relevant factors, you can make the best heating choice for a spacific situation.

Factors that should be considered include:

1. Availability of chosen energy source:
   -security of supply in area
   -cost (and anticipated future costs)
2. Human comfort concerns:
   -evenness of heat distribution
   -noise (some systems are quieter than others)
   -health considerations (systems with least air movement are better for allergy sufferers)
   -aesthetic considerations (some systems create a visual presence in the space)
3. Financial considerations:
   -initial cost vs operating costs
   -maintenance costs
   -manufacturer's warranties
   -reputation of system supplier and installer
   -resale value
4. Technical requirements:
   -special construction requirements
   -properly sized system, including detailed heat loss and design
   -CSA approval
   -space requirements of the system (mechanical rooms, flues, ducts)
   -controls available

David Blythe is a Vancouver engineer.

NEXT ISSUE: we start a review of heating equipment suitable for low energy houses, including outline specifications and a brief commentary.

BUILDING CODE ENERGY STANDARDS

By Ray Cole

"Over a long period of time we have begun to understand the laws of nature. These have been determined by forces outside of our control. We cannot change them. On the other hand, the laws of man are determined by government. It is their nature to be constantly revised." (1)

The Canadian Story

Since 1983 the 'average' energy efficiency of Canadian houses has improved. Although market forces will generally tend to generate and maintain appropriate levels of conservation there is a need to both promote high standards and guarantee certain minimums. The two major promotional programs in Canada are R2000 and the Super Double E (SEEH).

R2000 was started in 1983 by the Federal government to provide incentives for the building of improved energy efficient houses. Despite echoes of concern over its adminstration, the basic premise of providing a practical educational programme for builders remains unquestionable. However, it continues to fall behind its original goals in terms of financial support and units constructed. SEEH, an upgrade of the earlier Energy Efficient program initiated by the Canadian Electrical Association continues to be used as a hallmark of energy efficiency; its standards are on a par with R2000 but, involve less adminstration to qualify.

The formulation of energy standards is, invariably, a compromise of the general housing stock on the one hand and the implications on the individual designers, buiders and owners on the other. It is the responsibility of government to instigate and enforce energy standards which become essential as general interest and concern for energy issues wanes. At this point there are two documents which cover 'minimum' conservation standards: the 'Residential Standards' and 'Measures for Energy Conservation in New Buildings".

The Residential Standards (Part 9 of the National Building Code)(2) contain requirements which go beyond the NBC, but generally only apply to National Housing Act financed housing. The first edition of 'Measures for Energy Conservation in New Buildings', prepared by the Associate Committee on the National Building Code of NRC, was published, in 1978 and later revised in 1983. (3)

'Measures' are recommendations that must be adopted by the various authorities having power to enforce them before becoming regulations.

They form the basis of energy standards only in Quebec. However, the Quebec regulations go beyond the normal obligation of architects and engineers and call for the submission of certificates of compliance to building owners. This certification includes, in part, certification of completed work. Architects and engineers in Quebec require contractors to swear that they performed the work in accordance with the regulations.

Vancouver and B.C. have yet to adopt any energy conservation regulations. Throughout 1980 the Vancouver City Energy Conservation Committee examined the 'Measures' to see how they might apply to the City.

After making several alterations, a modified version of the 'Measures' was approved in principle by City Council in 1981, but concerns over increased construction costs due to enforcement of the proposed new energy code were raised. The provincial government turned down the City's application to enforce the measures.

Recently, the Building Standards Branch of the B.C. Department of Municipal Affairs has been formulating ammendments to the 1985 edition of the National Building Code. Proposals were made to include energy conservation within the new edition of the code. These would only relate to residential buildings and specify minimum insulation levels in walls, roofs, and foundations. The proposed values are modest in comparison to market levels and not sensitive to regional variations in climate, (as shown in Table 1). To date, the Advisory panel to the building Standards Branch has rejected the proposal mainly on the basis of being too far below market levels and not being comprehensive.

Action in the US Northwest

In contrast to this hesitation to introduce an energy standard, many regions in the USA have made positive moves to

BUILDING CODE ENERGY STANDARDS

TABLE 1: COMPARISON OF ENERGY STANDARDS (PRESCRIPTIVE)

	DEGREE DAYS (°C)	1983 ENERGY MEASURES	R2000 SEEH	NORTHWEST POWER PLANNING COUNCIL	PROPOSED 1985 BUILDING CODE (B.C.)
WALLS (RSI)	<3500	2.4	3.5	3.4-4.4	2.1
	5000	3.0	3.5	3.4-5.5	2.1
	6500	3.6	3.5	3.4-5.5	2.1
	>8000	4.1	3.5	3.4-5.5	2.1
ROOF (RSI)	<3500	3.6	—	6.7	4.2
	5000	4.7	—	6.7	5.2
	6500	5.6	—	6.7	6.0
	>8000	6.4	—	6.7	6.3
GLAZING	<3500	DOUBLE	DOUBLE	TRIPLE	DOUBLE
	5000	DOUBLE	DOUBLE	TRIPLE	DOUBLE
	6500	TRIPLE	DOUBLE	TRIPLE	TRIPLE
	>8000	TRIPLE	DOUBLE	TRIPLE	TRIPLE

provide an effective energy standard for housing. The Northwest Power Planning Council, with members from Idaho, Montana, Oregon and Washington, was created in April 1981 to establish a plan for regional energy conservation and electric power suply. The object of this plan was to improve the standard of electrically heated residential buildings and thereby reduce the need to build expensive new power plants in the region.

The result was a model energy standard to be implemented as part of code requirements (5). Failure to implement the standards or an equivalent would make utilities liable to a 10% surcharge on the power they buy from the Bonneville Power Adminstration (the regional power wholesaler).

The proposed standard, which has already been implemented by the City of Tacoma, has two interesting aspects:

1. It specifies minimum standards which meet or exceed those in the R2000 program.
2. It provides and identifies a flexible process for accomodating energy in building design.

The model standard provides three alternative approaches for meeting energy efficiency: component performance, energy budget, and prescriptive.

The component performance approach, specifies the maximum overall R-value that must be achieved by the walls (including windows and doors), roofs, and floors; it enables trade-offs to be made within them provided the total effect is unchanged. Design R-values are given for three broad climatic zones, and distinction is made between residential and non-residential buildings. Although the main emphasis is directed at the overall insulation levels and air tightness, the component procedure makes provision for solar design. Additional window area can be introduced if it meets specified conditions of glazing type, orientation, tilt, shading and that a proportional amount of additional thermal storage capacity is provided.

The annual energy budget imposes the least constraint, and specifies the maximum allowable annual energy consumption. This approach poses the greatest difficulties in the implementation and checking. It places the onus on the designer to demonstrate the energy performance of the proposed building.

Distinction is made between low-rise residential and other buildings. For low rise residential buildings, maximum annual energy budgets are specified in the standards. For other buildings, an alternative design is allowed provided that it can be shown, by calculation, to have an annual energy budget no higher than one designed to meet the component performance requirements of the standards. Thus, should the designer wish to explore innovative low energy design solutions, the procedure requires a double set of calculations to be made, one to establish the energy budget of a building which meets the component performance criteria, and the other to ensure that the proposed building has an energy budget below this target.

TABLE 2: COMPARISON OF ENERGY BUDGETS (kwh/m²/yr)

	DEGREE DAYS (°C)	1983 ENERGY MEASURES	R2000 SEEH	NORTHWEST POWER PLANNING COUNCIL	PROPOSED BUILDING CODE (B.C.)
ANNUAL ENERGY BUDGET	<3500	-	31.3	21.5/28	-
	5000	-	42.5	34.4	-
	6500	-	53.8	34.4	-
	>8000	-	65.0	34.4	-

The prescriptive standards, which only apply to buildings less that 5000 sq.ft. or dwellings units of three stories or less, specify minimum thermal resistances which must be achieved in building assemblies and maximum allowable areas of

glazing in the building enclosure.

Distinction is made between 'single family dwellings' and 'multi-family dwellings and other occupancies up to 5000 sq.ft.' Values are specified for three climatic zones. In addition, flexibility is provided in the prescriptive portion of the measures by acknowledging differences in insulation level and glazing between 'well insulated', 'sun-tempered', 'passive solar' and 'heat pump' energy strategies.

The standard was originally to be implemented by January 1986, but it has been proposed that this be delayed until January 1989. This delay follows analysis of the results of a demonstration program involving over 400 houses built according to the standards throughout the Northwest which suggested that builders require more time to make adjustments. It is proposed that to avoid the 10% surcharge during the transition period, an intermediate standard determined by cost effectiveness to the consumer must be in effect by January 1987 and then incentive payments made by the regional power system to meet the additional cost to achieve the full standard by January 1989.

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4. Needra, P. 'Certification Concerning Energy Saving Regulation in Quebec', Loss control Bulletin No. 73, Professional Liability Loss Control Program, June 1985
5. Northwest Conservation and Electric Power Plan, Appendix J: Model Standard for Energy Conservation in New Buildings'.

Ray Cole is a professor at the U.B.C. School of Architecture.

UPDATE
THE POLYETHYLENE QUESTION

The premature failure of polyethylene air/vapour barriers in Scandinavia and Canada have led to studies to determine the extent of the problem. Since the last issue of SOLPLAN REVIEW was published, in which we discussed a number of the central issues, we have come across a technical report prepared by Scanada Consultants for CMHC. We thought our readers may be interested in a couple of its conclusions:

"In a significant number of cases, the short life characteristic (the failure mode) appears to relate directly to the film extrusion process."

(This suggests that manufacturing processes may be contributing to a short life span.)

"There is good evidence to conclude that some vapour barriers currently being distributed are doomed to premature failure, and there is some field inference that the incidence of such inferior film has increased in recent times."

This suggests the situation may be getting worse. However, as a result of recent findings, improved performance standards for new vapour barrier films will be developed. It is expected that future work will investigate the design requirements for air/vapour barrier materials.

The emphasis on air/vapour barriers (and the use of polyethylene) in residential construction is recent. The problems that are being uncovered underline the importance of thinking of the house as a total system - if building techniques change, the purpose of all building elements in the new system must be understood and evaluated.

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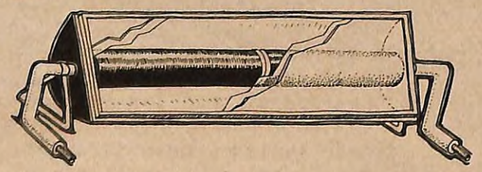

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CUTBACKS AT B C HYDRO

B.C. Hydro, the major electric and gas utility in B.C. has made drastic program and staff cutbacks. A weak economy, surplus capacity, and the tendency of energy consumers to improve energy utilization, cause the utility to face reduced energy demand and lower revenues.

Among the cutbacks is the elimination of the Energy Use Engineering Department. This department was responsible for providing technical support to customers and the utility's customer agents. It also monitored energy conservation, solar and other renewable energy source activities. Seminars, workshops for the trades and public, and a series of publications were produced - all good, useful sources of information for B.C. energy users.

The full impact of these changes is yet to be evaluated. However, it is certain that the focus of the corporation (and the provincial government) has shifted toward increasing electricity sales. We may well see a rebirth of the 'gold medallion' all-electric home program - promoting sales of electricity.

Large industrial users are already being offered electricity discounts for extra use. The Minister of Energy says that "when the surplus is used up, the discount sales will end".

Regrettably, this policy ignores the fact that electric power sales cannot be equated to that of potatoes or apples, whose consumption can fluctuate according to price, supply and demand, or fashion - there being many alternatives available. Once a commitment is made to electrical use, it is more difficult (and costly) to switch the infrastructure. Has the lesson of the 1973 energy crisis been lost?

The Energy Use Department was the only government agency in B.C. involved with energy conservation and renewable energy activity. The provincial Ministry closed its own Conservation and Renewable Energy Branch in 1983. The government now has no one who can provide technical expertise in this field to residential, commercial and industrial energy users in an unbiased manner.

On a personal note, the location of the Energy Use Department next door to our editorial offices was a remarkable coincidence (we were here first). We will miss our friends and acquaintances there.

HRV TESTING UPDATE

Z VENT 2020: TESTING UPDATE

Revised tests at the Ontario Research Foundation show that cross contamination (the ratio of exhaust air in the supply air flow to total supply air flow leaving the HRV) for the Z Vent 2020 HRV unit is 4% at 50 pascal pressure difference. This is a substantial improvement over the results that were originaly published by the ORF.

ORF HRV TEST RESULTS

HRV performace results should be available within the next month or so. The material is ready, but definitions and terms are being finalized and coordinated with US agencies, so that there will be a uniform North American labelling standard.

NEW HRV

NEW FROM STAR HEAT EXCHANGERS

NOVA: A 70 CFM THROUGH THE WALL HRV

Star Heat Exchangers have introduced a new wall mounted heat recovery ventilator. This is a 70 CFM unit, designed for easy installation in 4" stud walls.

The unit has a variable speed control, automatic defrost system, indicator lights for on/off and defrost mode, and adjustable air flow grills. The core is a polystyrene plate, counterflow core, with 2 axial fans mounted side by side on the back side of the unit.

The manufacturer's specs are:

Capacity:	70 cfm
Power consumption:	40 watts max.
Filters: disposable fiberglass	
Adjustable louvers	
Weight: 5 kg.	
Unit dimensions (overall):	
Height	63 cm (24 13/16")
Width	40.5 cm (16")
Depth	17 cm (6 5/8")

Colour: white, woodgrain louvres

As a self contained unit, with no ducting, this HRV should find applications in the retrofit market - for existing houses, mobile homes, and any areas that require localized ventilation.

The depth is designed for 4" stud walls. Wall thicknesses greater than 6" will not readily accomodate this HRV.

The manufacturer is targeting the retrofit market in their campaign.

ENERGY EFFICIENT FIREPLACES

Open fireplaces downgrade the operation of energy efficient buildings, yet there is romance in an open fire crackling on a cold day. Home buyers still insist on fireplaces even though it means dollars going up in smoke.

Standard masonry fireplaces can be net energy drains. Factory built heat circulating units can be up to 30% efficient. Airtight stoves can be up to 60% efficient (a typical central furnace is 55-80% efficient).

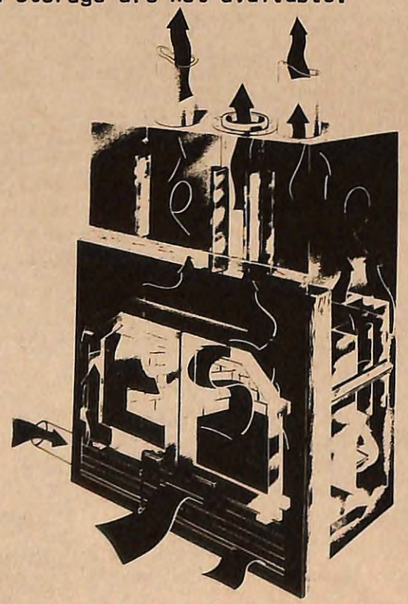
There are two new units in the marketplace, one from Norway (Jotul) and the other Canadian made (Security Chimneys). Both provide an alternative to the inefficient conventional fireplace.

BIS

Security Chimneys Ltd. have a new high efficiency built-in stove, called BIS, which combines elements of an air tight stove with that of an open fireplace.

It is a 'zero-clearance' unit with large, tight fitting glass doors - keeping the fire clearly visible. (An outside combustion air kit is available). The doors come with cast iron or brass trim, and hardwood knobs (making them easier to operate).

Because it is a zero-clearance unit, not requiring masonry, the benefits of heat storage are not available.



Overall unit dimensions:
Height: 51"; Width: 33"; Depth: 24";
Firebox width: 26"

List price (West coast) for the basic unit, with outside combustion air kit: Approx. $1100.00
The unit has a 25 year limited warranty.

JØTUL

Jotul, the Norwegian manufacturer of wood stoves, has introduced a cast iron fireplace, designed to be installed in a masonry structure.

Cool indoor air enters through grills below the fireplace. It is heated as it circulates around the cast iron firebox and flows by natural convection back into the house.

The masonry enclosure acts as a storage element to retain and radiate heat even when the fire dies down - as long as the masonry is contained inside the insulated envelope of the house!

The large cast iron glazed bifold doors allow the unit to be operated as a wood stove. For maximum efficiency, the fireplace should be operated with doors closed. (An outside combustion air kit is available).

Overall unit dimensions:
Height: 44 1/2"; Width: 29"; Depth: 22"
Firebox width: front 24 1/2", back 14-1/2"

Claimed heat output: 15,000-55,000 BTU
Burn time: 8 hours

List price (West coast) for the basic unit with an outside combustion air kit: Approx. $2100.

MOISTURE STUDY

MOISTURE IN WALLS: CMHC STUDY

CMHC has announced the formation of a joint CMHC/CHBA task force to study moisture problems in exterior walls of wood frame houses in Atlantic Canada.

In the past 15 years, there have been changes to the basic design and operation of houses: they have become better insulated and more air tight; they use flue-less heating systems; and there has been a trend to lower operating temperatures in dwelling units.

These new trends lead to higher humidity levels because of the decreased venting of the house through chimney and other openings. When this moisture finds its way into the building structure, a considerable amount of water may condense in the wall.

During the next 18 months the Task Force will examine practical solutions to moisture problems in exterior walls. It is expected that the initial result from this study will be the production of a publication for builders, outlining details aimed at inhibiting the moisture.

LOW ENERGY BUILDING COUNCIL

The Low Energy Building Council (LEBCO) was established this June in Montreal as a division of the Solar Energy Society of Canada (SESCI), dedicated to fostering the development and dissemination of information relating to the design and construction of energy efficient buildings.

Participants in the low energy building field have felt a need for a Canadian body devoted to low energy building issues. The need for a Canadian organization is not a reflection of nationalism, but rather a recognition that many issues in low energy building are political as well as technical. Standards, codes, etc. are created politically.

The group that will find LEBCO of special interest include design-builders, low energy builders (including R2000 contractors), designers, consultants, product manufacturers and distributors.

The aims of LEBCO are:
1. To provide a forum for persons and organizations involved in the research, design, and construction of low energy buildings in Canada.
2. To promote the interests of the low energy building industry to the public, educational institutes, government, and related industries through communication and education.
3. To monitor and evaluate the effects of low energy building technology upon social, technical, economic, and industrial development in Canada.
4. To develop and disseminate information about low energy building to members, government officials, and the public.
5. To represent the industry in matters concerning standards, codes, government policy, etc.

Specific programs are now being developed by the interim executive: Chairman: Greg Allen (Toronto); Vice-Chairman: Richard Kadulski (Vancouver); Secretary: Tim Mayo (Ottawa); Treasurer: Bob Besant (Saskatoon); Memberships: Michael Glover (Ottawa); Programs: Rob Dumont (Saskatoon); Councillors: David Leslie (Quebec City); Andrew Cole (Toronto); Steve Carpenter (Waterloo).

Program suggestions that are being considered include: technical meetings and conferences (the first next June in Winnipeg), tours, product showcases/new materials expositions, information exchanges, tours.

SESCI is a national technical society, interested in all aspects of conservation and renewable energy activity. SESCI members have been active in low energy building issues for some time, as a natural progression of research and development in passive solar issues.

LEBCO will be a semi-autonomous division of SESCI, with its own executive. The SESCI office will provide logistical support.

Information on memberships, fees, etc. will be available shortly. Anyone interested in LEBCO is encouraged to contact any member of the interim executive (or SOLPLAN REVIEW). You will receive further information as soon as it becomes available.

MOISTURE PROOFING WOOD FOUNDATIONS

Preserved wood foundations have gained popularity in Canada in the past 10 years.

Recommended details published by the Canadian Wood Council show methods for sealing and damproofing wood foundations. It is important to keep moisture away from the wood. Recommended construction details minimize soil contact and water accumulation.

Key items in the recommended details are the use of a sheet of 6 mil polyethylene against the plywood, and the use of compacted gravel against the plywood to provide a drainage bed.

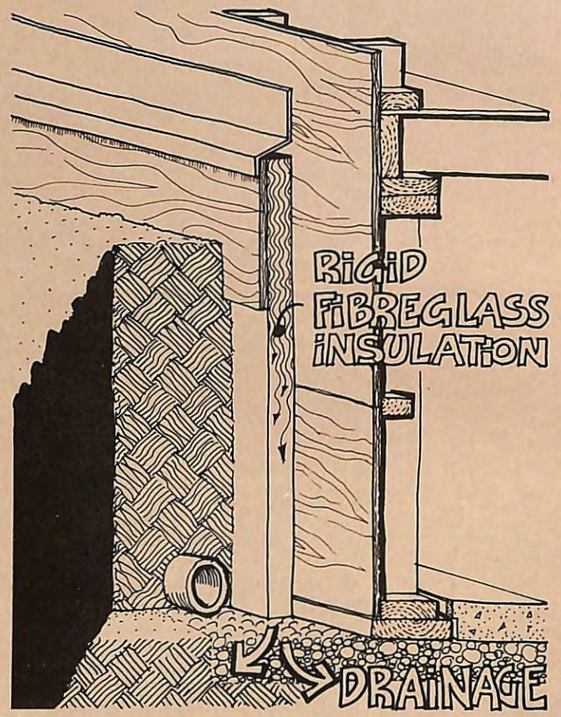
Readers of SOLPLAN REVIEW will realize that polyethylene is a questionable moisture barrier. Poly's effectiveness depends on its quality and installation treatment of the material.

The use of granular backfill (shown and specified on all details) looks good on detail drawings and specifications. Unfortunately, given the cost (and availability) of granular material in many locations, and normal construction shortcuts, the excavated material on the job site is usually used for backfill - regardless of its quality. This means that the drainage bed around the foundation may not function properly.

Although the wood used is treated with chemical preservatives that resist attack by decay organisms and termites, it still can potentialy suffer damage. Wood is an organic substance subject to decay processes. The preservative treatment is never 100% effective in making wood fibres free from potential for decay.

We do not want to discourage the use of wood foundations. They have proven to be an effective construction technique in cold climates. Instead, we suggest an alternative that will resolve potential moisture problems and help keep the foundation warmer.

Fiberglass insulations are not subject to fungi, bacteria or mildew attacks from the soil. They are an effective capillary break, providing an unobstructed route for



gound water to drain to the footing, as the fiberglass fibers are layered in the plane of the board. The surface in contact with the soil acts as a drainage layer while the remainder of the insulation remains dry. As a result, the insulation is not subjected to the degrading effects of moisture, retaining its insulating properties.

Exterior fiberglass foundation insulation has been used in Scandinavia for over 10 years.

Rigid fiberglass insulation can be used for any type of foundation, not just wood. Concrete foundations subject to cracking will stay dry when insulated with fiberglass board on the exterior. This is a good material to use on retrofits, where wet basements are a problem.

At present, the only rigid fiberglass board suitable for below grade use is Baseclad, manufactured by Fiberglass Canada.

AIR BARRIERS & VAPOUR BARRIERS: THERE IS A DIFFERENCE

By Les Shuert

Airtightness of houses did not become a feature of house construction until the mid 1970's when energy conservation became an important issue. It was then realized that the largest single factor in house heat loss was air leakage.

Infiltration and exfiltration are factors in air leakage. Infiltration is the flow of air into a house through openings in the outside shell of the house. Exfiltration is the flow of air out of the house. Each of these mechanisms can, in certain conditions, cause considerable damage to the building.

The concern about exfiltration is that moist, warm indoor air can damage the house structure. Moisture condensing in a cold wall can provide ideal conditions for fungus and rot to attack structural wood.

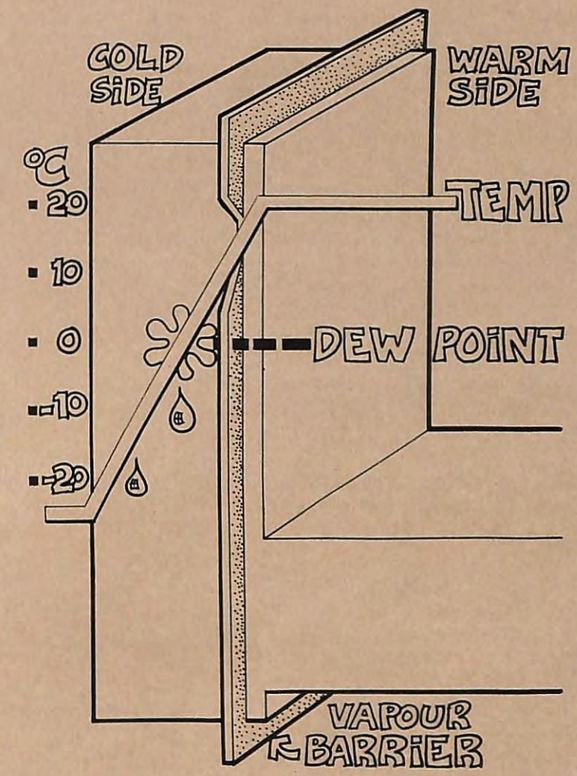
Infiltration not only means cold drafts into the house (meaning a loss of heat from the house) but it is also the driving mechanism for the exfiltration of air.

Pressure difference between the inside and outside is created by wind acting on the building envelope. On the windward side, positive pressure causes infiltration into the house. On the leeward side, negative pressure encourages exfiltration.

Air movement in and out of a building will take place through holes or gaps in the construction such as around window and door frames, electrical outlets, between wall/floor plates, plumbing or service stacks.

To control the movement of air and moisture through the building envelope, there is a need for both an air barrier and a vapour barrier. The term 'air-vapour barrier' describes an element which both stops air movement and has the characteristics of a vapour retarder.

A vapour barrier controls moisture by slowing the rate of vapour transmission through the pores of a material. Materials that are effective vapour barriers have a low permeance to water vapour. Typical vapour barriers are polyethylene, foils, vapour retardant paints, foil faced rigid foam insulation boards, some closed cell extruded polystyrene insulation boards and plywood.



There is a distinction between water vapour and (liquid) visible moisture. Many materials that appear to repel moisture are permeable to water vapour.

Vapour barriers must always be located on the warmer side of the wall. Otherwise condensation will occur on the cold surface. A rule of thumb is that no more than one third of the total insulation value can be located inside the vapour barrier.

An air barrier stops the movement of air under pressure through the wall. It does not have to meet the vapour diffusion requirements of vapour barriers. Building compoments that can be used as air barriers are drywall, plywood, polyethylene sheet or spun olefin sheets (such as 'Tyvek'). Building paper is not an air barrier.

Air barriers may have a high permeance to vapour. The air barrier may be located at any point in the envelope. To be

effective, the air barriers must be applied properly, and joints sealed.

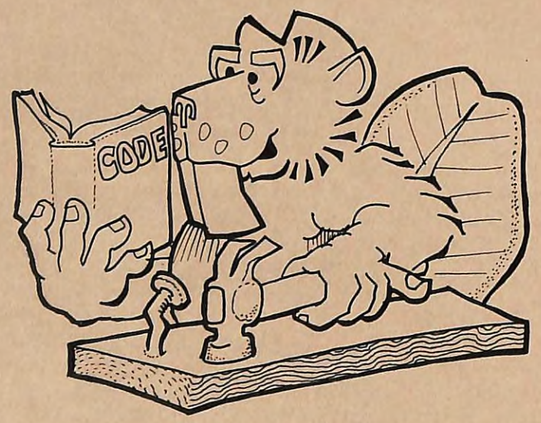
The same materials can act as both air and vapour barrier. However, it is important to note that the operating principles are not the same. Never create a vapour barrier on the exterior of the building. If a vapour barrier is applied properly on the warm side of the wall, provision has to be made to allow any moisture in the wall framing (especialy in new construction) to escape outside.

Exterior sheathing materials such as plywood and extruded polystyrene must not be tightly sealed in order to avoid creating that second vapour barrier.

Some builders cut saw kerfs in areas that may accumulate moisture, such as under windows and in trimmer joists.

Remember, air barriers are not necessarily vapour barriers; only moisture need be stopped on the warm side of the wall; and an air barrier is essential for energy conservation.

Les Shuert is a low energy builder in B.C.'s Okanagan valley.



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R2000 NEWS

TURNER NEW B.C. R2000 COORDINATOR

Derick Turner, a Prince George builder has been named the new R2000 coordinator for B.C. He has built a number of R2000 houses in central B.C., and has been an active booster for low energy building. The appointment takes effect in September.

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COURSES

LOW ENERGY RESIDENTIAL RETROFIT COURSES

Residential Renovators Training Course

The Northern Alberta Institute of Technology (NAIT) has initiated a 24 week course for Alberta builders that combines classroom instruction with a full fledged retrofit of a local house. A pilot course earlier this year was so successful that 2 more are planned for 1985/86, starting October 21, 1985. Interested builders can contact:

Shelley Brownlee, NAIT Continuing Ed
11762-106 St. Edmonton, Alta. T5G 2R1
Phone: (403) 471-8675

HRV INSTALLER CERTIFICATION

The second round of training courses for heat recovery ventilator installers, organized by the Heating Refrigeration Air Conditioning Institute (HRAI) is being planned for this fall - mid October to November.

These sessions are designed for heating contractor tradespersons. Eligible attendees after completion of the course will be certified to install HRV's. Certified installers are a requirement of the CSA standard.

Builders should encourage their heating contractors to attend.

For information on time and place of the next course in your area, contact the HRAI national office (tel: 416-239-8191), the local EMR-CREO office, or the CHBA-R2000 coordinator.

NEXT ISSUE:

* Heating systems for energy efficient houses: what products are available on the market.

* Plus more news about new products, news, and much more. Be sure not to miss any issues. SUBSCRIBE TODAY!